Geophysical Research Abstracts, Vol. 8, 06247, 2006
SRef-ID: 1607-7962/gra/EGU06-A-06247

Polar stratospheric cloud observations in northern Finland in the 2004-2005 winter

R. Kivi (1), E. Kyrö (1), A. Dörnbrack (2) and H. Vömel (3)

(1) Finnish Meteorological Institute, Sodankylä (rigel.kivi@fmi.fi), (2) DLR Institut für Physik der Atmosphäre, Oberpfaffenhofen, (3) CIRES, University of Colorado, Boulder

Temperatures in the Arctic ozone layer were unusually low during the 2004-2005 winter. In Sodankylä, Finland (67.4° N, 26.6° E) potential for polar stratospheric cloud (PSC) formation was the highest on record in February 2005 (81 % of all radiosonde observations showed temperature lower than threshold for nitric acid trihydrate) and one of the highest in January 2005 (40 % of all observations). PSC formation in the cold air masses was confirmed by a number of aerosol backscatter sonde launches from Sodankylä during the winter. PSCs were observed during each sonde flight in January and February 2005 (January 24, January 26, January 27, February 2, February 15 and February 22). During each of the observations the coldest layers were close to water ice particle formation temperature. Ice particles were detected during January 26, 2005 backscatter sonde flight, with maximum backscatter ratio 120 at 940 nm channel (altitude 22 km). During the other flights maximum backscatter ratios in PSC were between 5 and 45 at 940 nm in the 18-20 km altitude range. PSC vertical extent was remarkably high especially during January 26 and January 27, 2005 when PSCs were detected between 16 and 25 km of altitude. Ice PSC formation on January 26 and possibly before as indicated by temperatures is likely to have influenced water vapor distribution in the Arctic vortex. Significant reduction of water vapor was observed by a frostpoint hygrometer launch performed from Sodankylä nearly simultaneously with the ice PSC measurement on January 26, 2005. Water vapor reduction was observed in several layers between 18 and 23 km of altitude with up to 2 ppmv water vapor loss at the peak altitude of 22.5 km. The observed water vapor reduction can be explained by dehydration due to the formation of ice particles in the unusually cold Arctic vortex during late January 2005.